# Section 3 Configuration

A Hand Held Programmer (HHP) is used to interface to the Scully Automated Fueling System (SAFS™). The HHP has three operating modes:

**Programmer -** At the time of VDC installation, the HHP programs the VDC with the desired information to identify the vehicle and keep track of important vehicle parameters.

**Calculate Pulse Factor -** This is used initially to automatically calculate the odometer ratio also referred to as Pulse Factor. This may also be used periodically to adjust for slight variation between the dashboard odometer and the VDC odometer readings.

**Manual Authorizer -** Manually Authorizes the pump for a single transaction on equipment which may not be registered as part of the fleet, and does not have a VDC installed.

☞ ***Important***

*It is strongly recommended that users of the HHP be limited to the administrative service attendants and installation technicians.*


SCULLY
PART NUMBER
001309

*Figure 7* – **HandHeld Programmer**

## 3.1 Battery Replacement

HHP is supplied with two Lithium-Ion rechargeable batteries and one battery charger. HHP uses one battery, fully charge the battery before placing HHP to operation. To replace the battery:

1. Turn OFF the HHP
2. Take out the screw and remove the battery cover
3. Slide the battery downward until it stops
4. Lift the battery off
5. Place the new/recharged battery in the HHP
6. Slide the battery upward in the direction of the arrow on the back of the battery until it clicks into place.
7. Place and screw down the battery cover

***WARNING***

Battery may explode if exposed to fire

***WARNING***

To prevent injuries or burns, and to avoid damage to the battery, do not allow metal objects to contact or short circuit the battery terminals

**CAUTION**

**To avoid damage to the battery, do not place it anywhere that might cause the battery terminals to short together.**

**CAUTION**

**Charging your battery in anything other than a Scully supplied charger will void your warranty**

**CAUTION**

**Do not open the HHP battery compartment in a hazardous area. Battery MUST only be changed in a non-hazardous area. The charging of the battery MUST also be carried out in non-hazardous area.**

## 3.2 Keypad Operation

This section describes the keypad operating style of the HHP common to all operating modes.

### ON

To turn the HHP on, press the **ON/OFF** key once. The display first goes through a power-on self-test and then displays the main menu.

### OFF

Press **ON/OFF** key once while HHP is **ON** to turn it **OFF**. To conserve battery power, the HHP will also shut itself off when there is no key activity within 3 minutes.

### VERIFY

Pressing **VERIFY** key while holding the HHP coil near the vehicle T-Ring displays the VDC's programmed parameters. Once the VDC has been programmed, the data should be verified to make sure VDC is sending the correct information to the System Controller. This will not only verify that the VDC has been correctly programmed, but also that the VDC's transmitter coils work properly.

### **BS** (back space)

Press **BS** key to set the cursor back one space. Each subsequent press of the **BS** key sets the cursor back another space.

### ENTER

Pressing **ENTER** key will advance to the next field. After all data has been entered into a field, press **ENTER** to advance to the next field. If no data entry is required, press **ENTER** key to skip to the next field.

### BACK

Press **BACK** to go back to the previous field. Each subsequent press of the **BACK** key sets back one field.

**Entering Numeric Data**

On the keypad, press the number that you want entered into the field. The cursor will automatically advance to the next position. After all digits have been entered, press **ENTER** key to advance to the next field.

**Entering Alphanumeric Data**

On the keypad the **keys 1** through **9** have letters above the numbers. Pressing and holding the number key will scroll through all characters every 1.5 seconds. When entering data into an alphanumeric field, if you press and hold a number, it shows that character, but the cursor doesn't advance to the next position. Continuing to hold the number for 1.5 seconds shows the first letter marked above the number, continuing to hold the number shows the second letter marked above the number followed by third letter.

For example, to enter the string PBF96:

Press and hold **key 7** until P is displayed. Release the key, letter P is registered and cursor automatically advances to the next position.

Press and hold **key 2** until B is displayed. Release the key, letter B is registered and cursor automatically advances to the next position.

Press and hold **key 3** until F is displayed. Release the key, letter F is registered and cursor automatically advances to the next position.

Press and release **key 9**. Number 9 is registered and cursor automatically advances to the next position.

Press and release **key 6**. Number 6 is registered and cursor automatically advances to the next position.

**Entering Spaces and Special Characters**
If you need to enter space, press and hold **key 1** until space is placed. Release the key, space is registered and cursor automatically advances to the next position.

Special characters available are: **+**, **-**, and ***. Scroll through **(Decimal Point)** key to select one of the special characters.

**Editing Within a Field**
To edit data within a field, press the **BS** key to set the cursor back one space. It has now erased the data previously entered in that position. Each subsequent press of the **BS** key sets the cursor back another space. Once you get to the position you want, start entering the correct data.

## 3.3 HHP Operating Modes

**Programmer**
Once the VDC installation is completed, the HHP is used to program the VDC with the desired data in order to authorize it for refueling and enable it to keep track of important vehicle information. The VDC can be re-programmed with new data at any time. Turn the HHP on and from the main menu select **mode 1-PROGRAMMER**. You need to hold HHP Ring near the VDC T-Ring to establish communication for programming. If the vehicle is equipped with two T-Rings, perform the programming at one Ring, and then use the second Ring during the Testing the Programmed VDC. When communication with the VDC is established, the factory default parameters are read. Press **ENTER** and program new data specific for the vehicle as prompted on the HHP display. Remember, you do not need to maintain communication with the VDC T-Ring while entering new data. If at any time you make a mistake typing the data, you can press the **BS** key to back up one space at a time to the beginning of the current field, then type the correct data. Once all data is entered, hold the HHP Ring near the VDC T-Ring to transfer new parameters to the VDC.

> ☞ ***Important***
>
> *Do not program a VDC when the vehicle's engine is running. Make sure the vehicle is shut off during programming.*

**VDC Program Data Sheet**

As you will see, there are many fields that may be programmed into a VDC. It is helpful to write all of the data into a chart as you program a VDC. At the end of this manual, there is a sample chart that you can use to tailor your system.

Following is the information recorded in the VDC:

**Vehicle ID**

Twelve characters alphanumeric string identifying the specific vehicle.

> ☞ ***Important***
>
> *Every VDC must have a unique Vehicle ID because SAFS™ uses Vehicle ID as well as Fleet ID to monitor on-going transactions to tell if the nozzle is still inserted into the same vehicle/equipment.*

**Fleet ID**

A maximum Five digit numeric string (1 to 65534) will identify the fleet or department the vehicle is assigned to.

> ☞ **Important**
>
> *Every VDC must have a Fleet ID because SAFS™ uses Vehicle ID as well as Fleet ID to monitor on-going transactions to tell if the nozzle is still inserted into the same vehicle/equipment.*

**Engine Hours**

This field is 7 whole digits and 2 decimal places indicating the amount of time the vehicle's engine has been running. For vehicle's equipped with an hour meter, use the meter reading for Engine Hours, otherwise select a default value. The VDC counts time in increments of approximately 4 seconds once this signal is at +12 or +24 volts.

**Odometer**

This field is 7 whole digits and 2 decimal places indicating the current vehicle mileage. Use the reading from the vehicles dashboard odometer with any rollover factored in. The VDC receives odometer data as a series of pulses and counts in 1/100 of a mile.

**Pulse Factor**

The Conversion factor to interpret the number of pulses from the odometer to the number of miles traveled. The maximum value of the Pulse Factor is 131070. If the vehicle specification is not known, use CALC PULSE FACTOR feature to narrow down to the correct Pulse Factor.

**Install Odometer**
This field is 7 whole digits and 2 decimal places indicating the vehicle mileage at the time of VDC initial installation. Enter the reading from the vehicles dashboard odometer with any rollover factored in.

**TX Interval**
VCOMM broadcast cutoff time after the engine is turned off is TX Interval. This feature reduces VDC's vehicle battery consumption from 40 milli amp during normal operation to 20 milli amp during NO VCOMM (also referred as sleep mode). The default time for this post engine shutdown sleep time is 256 minutes (approximately 4 hours); maximum interval time is 45 days. TX interval is reset every time Engine Hour signal is set to +12 volt or +24 volt OR when Odometer pulses are received.

> ☞ ***Important***
> *If there is no Engine Hour signal or no Odometer pulses, the VDC will remain in NO VCOMM (sleep) and fueling is not permitted.*

**TX With Engine On (Y/N)**
Allows VDC VCOMM broadcast with engine ON. Default is **N** (no), fueling permitted only when engine is off. If it is desired to fuel while the engine is running, this field should be set to **Y** (yes).

After completion of programming you will be prompted with the following three screens before going back to the main menu. Verify the data shown is correct; otherwise go back to the PROGRAMMING mode and change the data from main menu.

## 3.4 Odometer Pulse Factor

The VDC receives odometer data as a series of pulses. These pulses may come from sensors mounted to the transmission, transaxle, transaxle, or drive shaft. The number of pulses of the odometer transducer required to register one mile is called Pulse Factor. The Pulse Factor is affected by several factors such as, tire size, axle ratio, and transmission specifications.

### 3.4.1 Mechanical Odometer Cable

Older vehicles use a mechanical cable to deliver odometer pulses to the dashboard. To allow the VDC to record these pulses, a transducer should have been purchased and installed according to the VDC Installation section. The formula for mechanical odometer Pulse Factor is:

*Cable revaluations per mile* multiplied by *sensor pulses per revolution*

*Cable revaluations per mile* is the number of revolutions the mechanical cable turns for each mile. This can be found in the transmission specification. For domestic vehicles the typical value is 1000 revs/mile and for foreign vehicles is 900 revs/mile.

*Sensor pulses per revolution* is the number of electronic pulses generated for each revolution of the sensor input. This is determined by the sensor manufacturer and may be stamped on the sensor. A typical value is 8 pulses per revolution. Therefore, the typical Pulse Factor for a domestic vehicle is 8000 and for a foreign vehicle it is 7200.

### 3.4.2 Electronic Odometer

On newer vehicles, the odometer signal to the VDC is tapped off an existing sensor. There are several ways to determine the electronic odometer Pulse Factor:

**Match Working Vehicle.** If a previously equipped vehicle is keeping accurate odometer data in the VDC, use that same Pulse Factor for all other similar vehicles in the fleet.

**Use Engine Computer Ratio.** Over-the-road trucks have smart engines allowing you to view many parameters through the diagnostic port. If the VDC odometer input is tapped off of the same signal source as the dashboard speedometer, you can use the speedometer ratio stored in the engine computer for the VDC Pulse Factor.

**Calculate From Vehicle Specs.** If the VDC odometer input is directly from the speedometer sensor mounted in the transmission, you may be able to calculate the correct ratio using specs from the vehicle manufacturer. Although there are variations among manufacturers and vehicle types, a typical speedometer system on a rear-drive-axle vehicle is described here. There is a gear, usually called the speedometer signal gear, mounted to the output shaft of the transmission. The speedometer sensor is mounted to the transmission so that its tip is in close proximity to the signal gear's teeth. A permanent magnet located in the speedometer sensor establishes a magnetic field at the tip. The magnetic field is repeatedly cut by the teeth on the signal gear, creating alternating current voltage impulses that are transmitted to the speedometer. The frequency and amplitude of the signal is directly proportional to the speed of the signal gear. The speed of the signal gear is determined by the rotation of the drive shaft, which is determined by the drive axle ratio and tire size. Therefore, the number of pulses-per-mile from the speedometer sensor is calculated from the following formula:

*Number of teeth on signal gear* multiplied by *tire revolution per mile* multiplied by *drive axle ratio*

*Number of teeth on signal gear* is found in the transmission specifications. A typical number of teeth is 16.

*Tire revolution per mile* can be found in the tire manufacturer's spec sheet. These figures are standard throughout the tire industry. For example, a new Michelin® 275/80R22.5 tire turns 514 revolutions per mile.

*Drive axle ratio* can be found in the manufacturer's line setting tickets, and also on a tag attached to the differential assembly on rear wheel drive vehicles.

If you do not know the vehicle specification, CALC PULSE FACTOR will help you to determine the Pulse Factor. This feature is also used when you are required to narrow down or re-calibrate to the correct Pulse Factor after a vehicle has traveled for a few weeks.

## 3.5 CALC Pulse Factor

At the time of initial VDC programming, enter 4000 as default Pulse Factor and drive the vehicle for a minimum of 10 miles. Make a note of the vehicle odometer reading turn the vehicle HHP on and:

- Select CALC PULSE FACTOR mode and hold HHP coil near the vehicle transmitter coil to establish and maintain communication during calculation process.
- Press **ENTER** key and enter the data as prompted on the HHP display.
- HHP automatically calculates the new Pulse Factor and updates both VDC Odometer and Install Odometer based on the data entered.

## 3.6 Testing the Programmed VDC

The HHP VERIFY function reads and displays data from a programmed VDC. It is the easiest way to confirm that the VDC is transmitting information. To test, turn on the HHP and hold its ring over a VDC T-Ring. Press the VERIFY key and immediately the display fills with data. Check that parameters are correct. If there is no display, replace programmer battery and check programmer operation on another VDC:

- Compare displayed vehicle identity to its nameplate.
- Check displayed fleet identification against prescribed parameters.
- When the odometer monitoring option is used, check displayed value against vehicle mileage.
- When the odometer monitoring option is used, compare displayed Pulse Factor value with prescribed parameter.
- When the engine ON monitoring option is used, compare displayed value against vehicle's hour meter. If the vehicle is not equipped with hour meter, compare with prescribed parameters.
- For vehicles with two T-Rings, repeat the above. Parameters should be identical to those of the first T-Ring.

## 3.7 Manual Authorizer

The Manual Authorizer mode is used to authorize (turn on) a pump for one transaction. This allows vehicles or other non-VDC equipped vessels to receive fuel and transmits important fleet management information to the System Controller, which keeps track of refueling transactions.

To operate the Manual Authorizer:

- Place the pump nozzle into the fuel inlet of the vehicle.
- Turn **ON** the HHP.
- Select mode 3. MANUAL AUTHORIZER.
- Enter the data as prompted on the HHP display.
- Hold HHP Coil within a few inches of the pump's Nozzle Ring (N-Ring) for 10 secs.

***WARNING***

Ensure nozzle handle is not engaged.

- The pump is now authorized for one transaction.

***Important***

*VEHICLE ID and FLEET ID data must be entered to authorize the pump. It is strongly recommended to enter MILEAGE and ENGINE HOURS data, however, they are not required to authorize the pump.*

# Section 4 Maintenance

The VDC requires no maintenance other than a re-calibration of the mileage for tire wear, tire change, or any change to the power train. Before attempting to perform re-calibration, consider the tolerance of mileage discrepancy due to tire wear and odometer accuracy. During vehicle preventive maintenance inspection, check and verify:

- That the VDC is securely installed to the mounting surface.
- Inspect all connections for corrosion.
- Make sure all connectors are well mated.
- Harness routing and fastening.
- The T-Ring wiring has a minimum of 2 inches clearance from any other wiring.
- Wiring connections for correct wiring (according to wiring diagram).
- Make sure the VDC wiring and harness is not attached to the steering column, brake cables, hydraulic or pneumatic conduits.
- When a transducer is included in the installation, make sure there is a tight connection between the harness and transducer.

## 4.1 Troubleshooting

If the VDC fails to program, using a voltmeter, check the red and black power lines for 12 or 24 volts. The switched 12V or 24V input (yellow wire) for monitoring engine hours must also be off (zero volts). Check these points with a voltmeter. If the voltage is out of range, troubleshoot the vehicle's electrical installation. Check harness wires for exposed conductors that could cause a short circuit. Inspect the connector pin of the harness for damage and possible short. Check wiring for loose connections.

Measure the resistance for 2 to 4 ohms of the T-Ring and check the polarity of the T-Ring wiring. Connect another good T-Ring or else replace the unit if the unit won't program. Once the VDC is programmed, it is ready to receive fuel. If the vehicle cannot be refueled, check the following:

- Incorrect programming of the vehicle identity (ID)
- Incorrect programming of the fleet identity (ID)
- Vehicle ID is not in the system's computer authorized vehicle list
- Fleet ID is not in the system's computer authorized fleet list

***If the VDC is faulty, it must be replaced. It can not be repaired.***

## 4.2 Battery Life Conservation Setting (Sleep Mode)

The VDC unit typically draws 40 mA with one T-Ring operating and 60 mA with two T-Rings operating. A sleep mode feature has been incorporated into the VDC, which when activated, reduces power draw on the vehicle's battery when the vehicle is not in operation. While in sleep mode the draw on the battery is reduced to 20 mA. When sleep mode is in effect the vehicle cannot communicate as an authorized vehicle to receive fuel.

Vehicles such as police cars with constant power drawing accessories and vehicles not used over a long period of time (example 2 weeks) should be programmed with a short activating sleep mode to conserve battery draw.

The self-discharge rate for a typical automotive battery is 10% per month. This is equivalent to 8.3 mA constant draw. For a brand new battery with 425 CCA (cold cranking amps) it would take approximately 10 weeks to self-discharge to 350 CCA, a worst-case starter requirement.

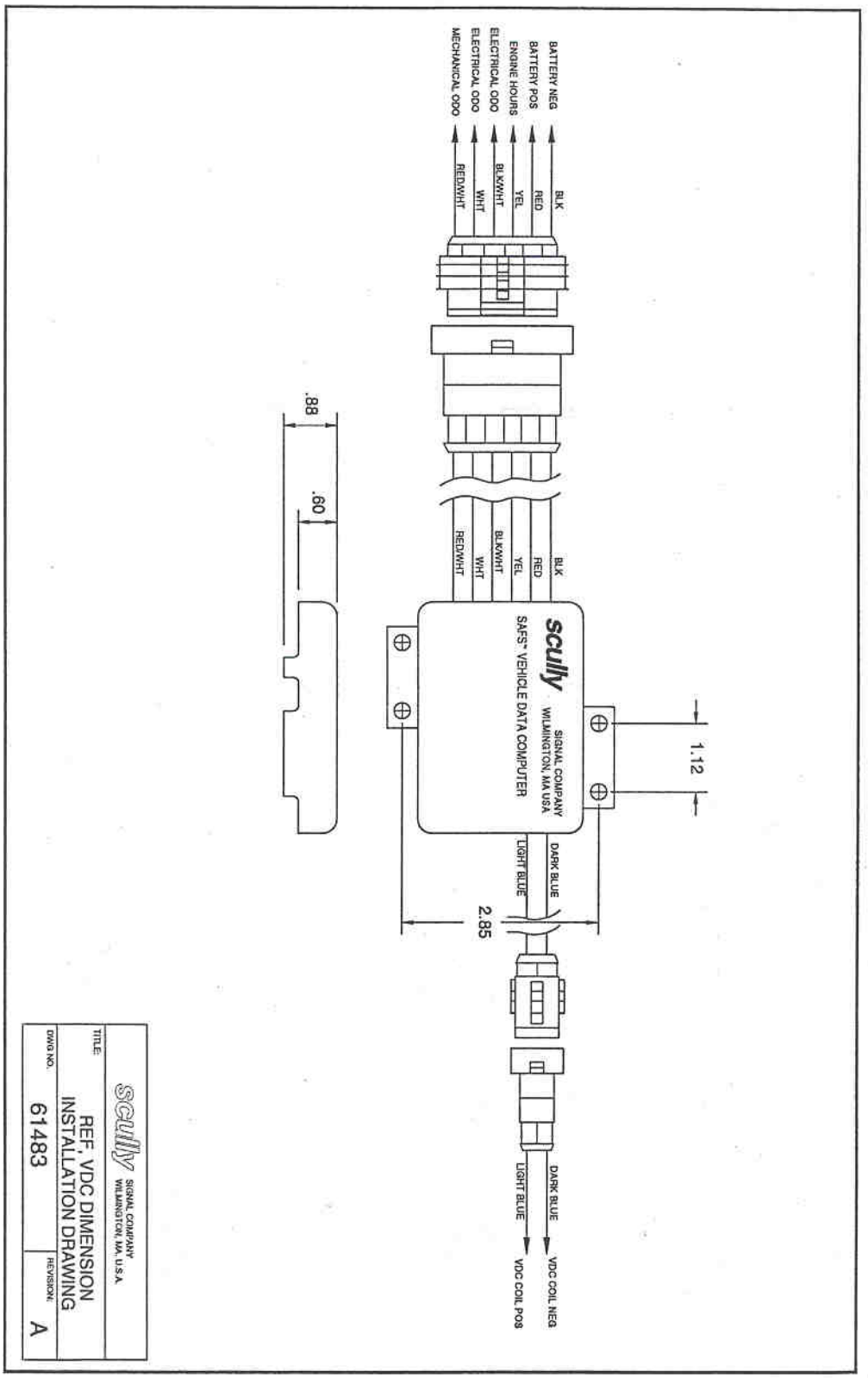
## 4.3 T-Ring Maintenance

The T-Rings require no specific maintenance; however, for safety reasons no fuel should be allowed to accumulate on the T-Rings. Any T-Ring whose outer case has been damaged by impact or excessive wear should be replaced. The cause of such wear should be addressed by repositioning the T-Ring for protection of its wires.

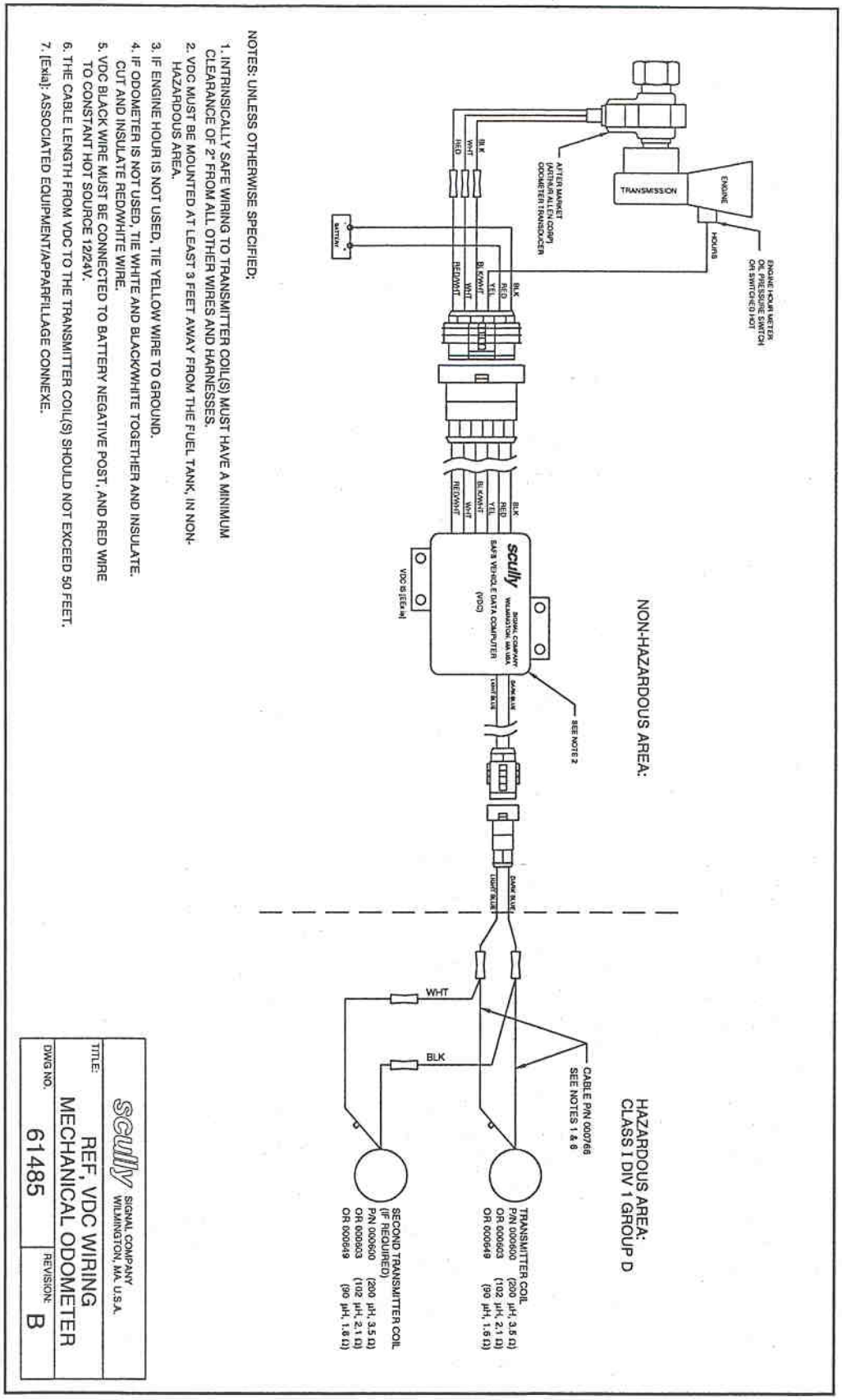
## 4.4 Odometer Transducer Maintenance

Some odometer transducers require periodic greasing. Follow the manufacturer's instructions to avoid accelerated wear. The pulse factor to be programmed for each vehicle is a function of the gearing, the tire size and the number of poles per shaft rotation.

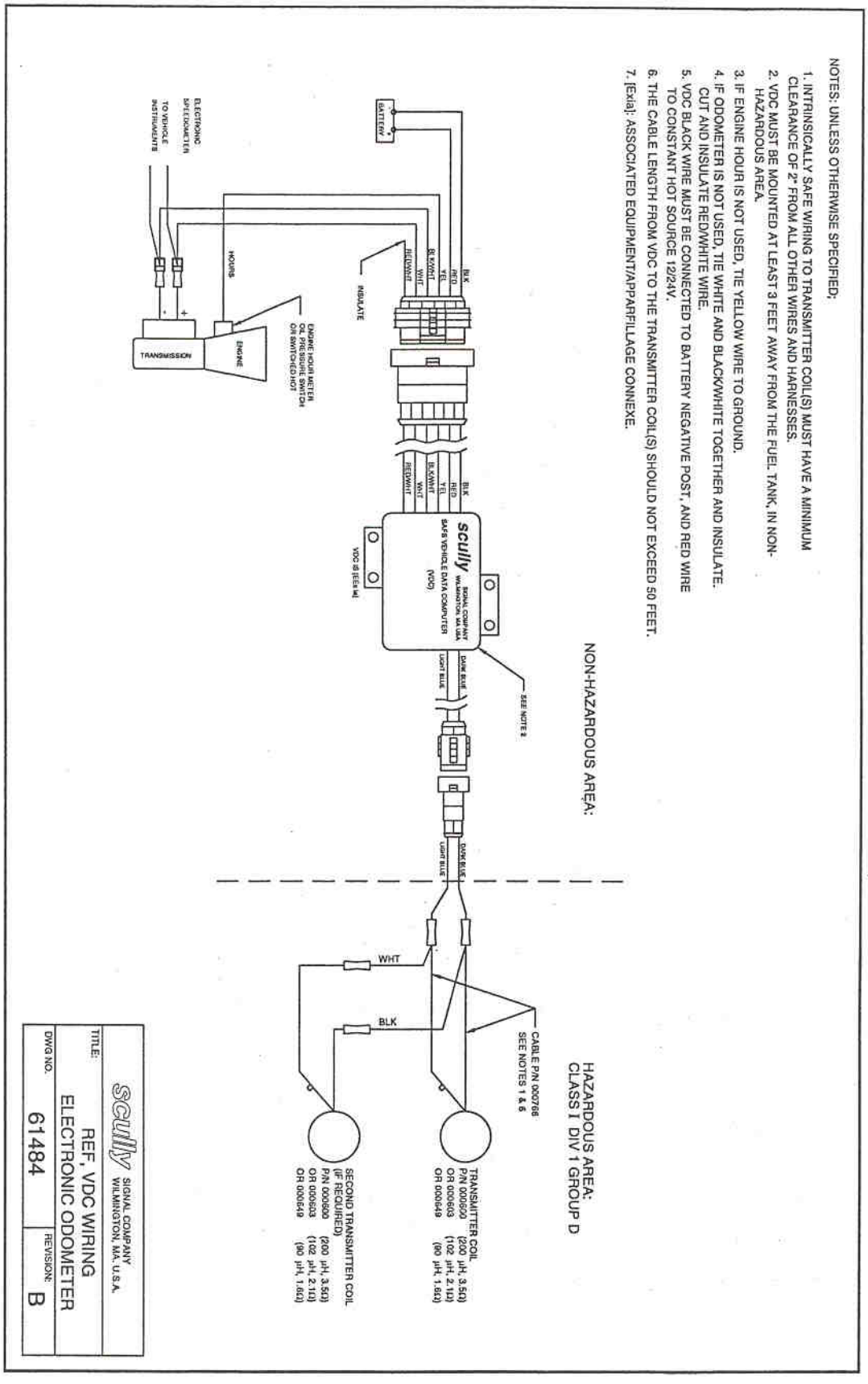
# Section 5 Installation Drawings



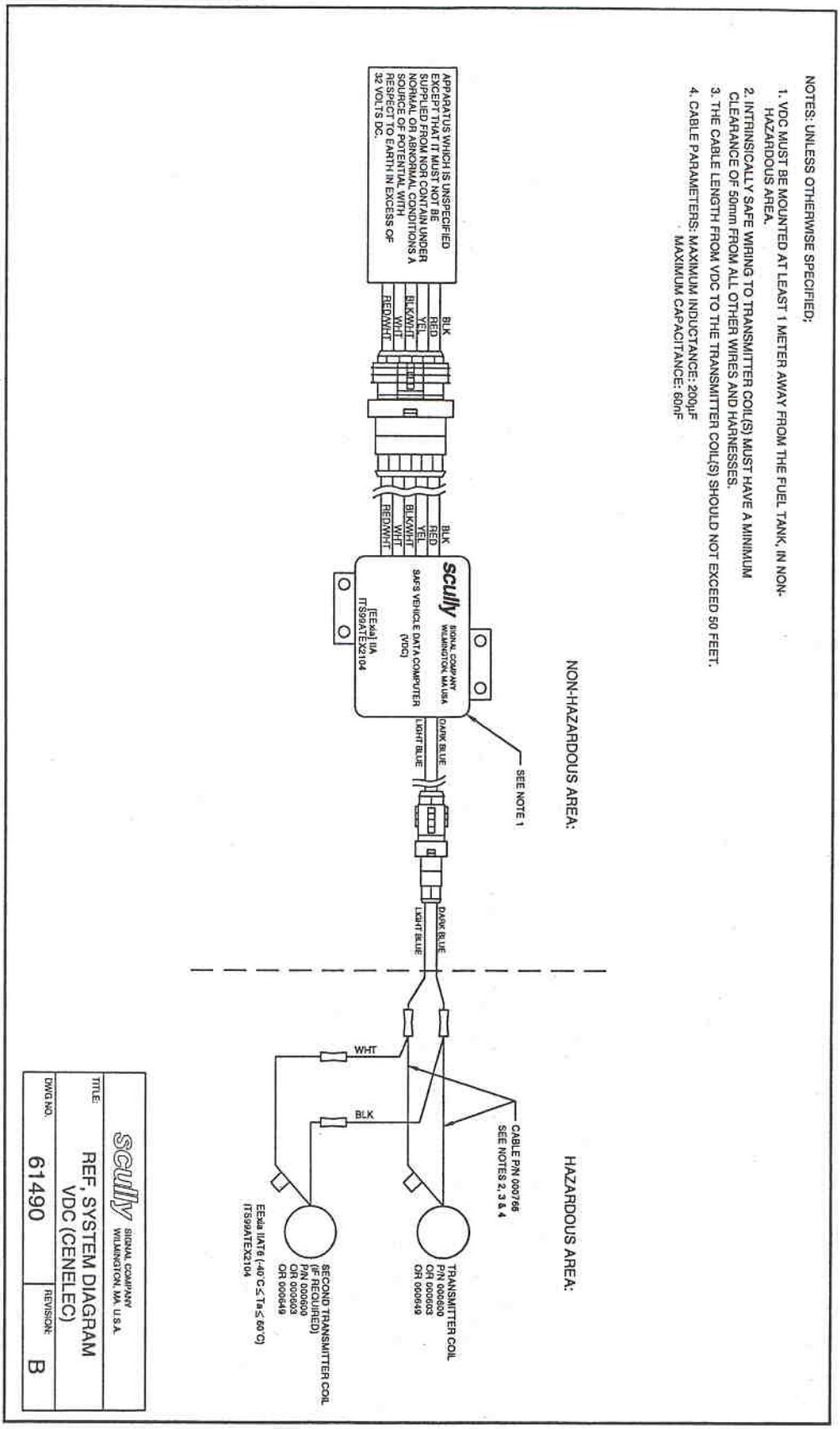

*5.1* **VDC Dimensions**




*5.2* **VDC Wiring: Mechanical Odometer** - *shown with optional harness*




*5.3* **VDC Wiring: Electronic Odometer** - *Shown with optional harness*




## *5.4* VDC System Diagram (CENELEC)

## VDC PROGRAM DATA SHEET

DATE:

| VEHICLE ID No. | FLEET ID No. | MODEL & YEAR | TANK CAP | FUEL TYPE | INSTALL HOURS | INSTALL MILES | PULSE FACTOR | INSTALL LOCATION |
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## VEHICLE CALIBRATION FACTOR DATA SHEET

DATE:

| VEHICLE MANUFACTURER | VEHICLE MODEL | YEAR | TRANSDUCER TYPE | PULSE FACTOR |
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